

1069.356



PATENT SPECIFICATION

NO DRAWINGS

1069.356

Date of Application and filing Complete Specification: Jan. 26, 1966.

No. 3449/66.

Application made in Germany (No. R39737 IVa/23e) on Jan. 26, 1965.

Application made in Germany (No. R40864 IVa/23e) on June 14, 1965.

Complete Specification Published: May 17, 1967.

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Index at acceptance:—C5 D(6A5C, 6A5D1, 6A5D2, 6A5E, 6A10, 6B12C, 6B12F1, 6B12FX, 6B12G1, 6B12G2A, 6B12G2B, 6B12G4, 6B12K2, 6B12K3, 6B12L, 6B12NX, 6C8); A5 B(1G, 1H, 1S, 31); A5 E(1A1A, 1A3B1, 1A4A2, 1A4A3, 1A4A4, 1A4B3, 1A4B4)

Int. Cl.:—C 11 d 1/12, C 11 d 1/60, C 11 d 3/02, C 11 d 5/06 // A 61 k, 1

COMPLETE SPECIFICATION

Detergent Mixtures comprising Anionic Detergents and Cation-Active Compounds

5 We, REWO CHEMISCHE FABRIK G.M.B.H., a German Body Corporate, of Steinau, Kreis Schlüchtern, Germany, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

10 The present invention is concerned with detergent mixtures comprising anionic detergents and cation-active compounds.

15 Anionic compositions are readily available and used for a whole host of pharmaceutical, cosmetic, hygienic, detergent or cleansing purposes. They may, for example, take the form of washing and cleansing compositions for textiles, e.g. blankets and carpets; solutions for cleansing medical equipment, food containers and cutlery; hair preparations and shampoos; disinfectants; and deodorants. The anionic compositions are prepared from anionic mixtures which are diluted with water to provide aqueous solutions to which additives, e.g. germicides, emulsifiers, sequestrants, colourants and propellants may be added. One form of mixture comprises anionic detergents and cation-active compounds but such mixtures have the drawbacks that clear aqueous solutions cannot be obtained, the solutions react with turbid amorphous or crystalline masses, e.g. soaps, and above all that unless the very minimum of cation-active compound is used, there is a tendency for the detergent to be precipitated. Because of this, such mixtures are usually used to prepare pastes, soaps, syndets or powders. It is possible to coat the cation-active compounds with inorganic electrically neutral salts in a preliminary stage but the resultant mixture only provides clear aqueous solutions when the concentration of anionic detergent is kept below 0.1% by weight. It is also possible to

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secure clear aqueous solutions of higher detergent concentration where the detergent is a sulphated or sulphonated compound, but only if very high concentrations of non-ionic substances are included. All in all, therefore, these mixtures suffer from serious disadvantages.

It has now been discovered that if only certain anionic detergents and certain cationic compounds are employed in a certain ratio range, the disadvantages mentioned are minimised, if not avoided completely. This invention therefore makes it possible to prepare clear aqueous solutions containing practically any concentration of anionic detergent which solutions, moreover, exhibit a high degree of viscosity even at low levels of dilution.

According to this invention, there is therefore provided a mixture for use as or in the preparation of solutions for any of the purposes hereinbefore specified, comprising a multi-functional anionic detergent and a cation-active compound, the proportion of the latter to the former not exceeding the molar ratio of

$$\frac{n-1}{m}$$

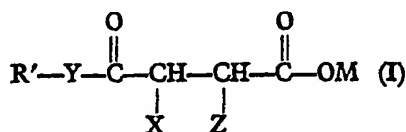
where n and m represent the number of functions of the anionic detergent and cation-active compound, respectively.

The term "functions" in this connection means the number of reactive groups present in the compound. For example maleic acid having two reactive carboxylic groups is bifunctional and a sulphosuccinic acid having two reactive carboxylic acid groups and one reactive sulphate group in the molecule is trifunctional.

In the case of a bifunctional anionic detergent, the proportion of cationic compound (for

example, a quaternary ammonium compound), may be up to a molar ratio of 1:1 and using a tri-functional anionic detergent, the proportion may be in a molar ratio of up to 1:2.

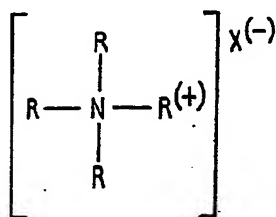
- 5 Preferred bifunctional anionic detergents include the sulphosuccinic acid derivatives of the general formula



- 10 in which R' represents an alkyl residue having at least 6 carbon atoms, Y represents a hydrocarbon chain optionally substituted with nitrogen or oxygen or both, either of X and Z represents a hydrogen atom and the other is the group $-\text{SO}_3\text{M}$, and M is a pharmaceutically or cosmetically acceptable cation e.g. a metal, amine, alkanolamine or ammonium.
- 15 Other anionic detergents include:—

- 20 sulpho-fatty acids, for example α -sulpho-fatty-acid;
 compounds with two sulpho-groups;
 compounds with one sulpho-group and one carboxyl group;
 compounds with two carboxyl groups in the molecule;
 25 phosphonic acids with an alkyl residue and two acid functions;
 and alkylphosphoric acid esters with two acid functions.

- 30 Appropriate cation-active compounds include the so-called "onium compounds"; for example, the ammonium, phosphonium, pyridinium and sulphonium compounds. Compounds preferred for commercial availability and manufacturing capabilities include the quaternary ammonium compounds of the formula
- 35



(II)

- 40 in which X is an anion and R represents an alkyl group. Preferred anions for substituent X include the halides, the saccharinate anions, the phthalimide anions, $\text{HSO}_4^{(-)}$ and the residue of an acid sulphimide. One of substituents R is desirably a long-chain alkyl residue having from 4 to 22 carbon atoms.

- 45 The mixtures may contain non-ionic com-

pounds and the usual washing agent additives for example phosphates, silicates and inorganic salts. As a rule they can be mixed with certain monofunctional anionic compounds without precipitation of insoluble components.

One advantage of the mixture of this invention is that a detergent compound usually considered to be insoluble can readily be formulated into an aqueous solution. If, for example, a sulphosuccinate which is soluble in water with difficulty in a 40% aqueous solution is mixed with an alkyl dimethylbenzylammonium chloride in equimolar proportions, the result is a thick paste which requires dilution to provide a clear solution. (The sulphosuccinate alone would have yielded the same product). On the other hand, if one instead follows the procedures of this invention and mixes a water-soluble sulphosuccinate with a water-insoluble quaternary ammonium salt (for example, an alkyl dimethylbenzylammonium saccharinate) in equimolar proportions, the result is a clear aqueous solution, even at a concentration of 40%.

A further advantage of the invention is that the solutions obtained are clear at high concentrations of detergent and another is that despite their anionic behaviour the solutions fully retain the properties of the cationic ingredient. Moreover, the use of "onium" compounds increases the viscosity considerably, so that, for example, even solutions with detergent contents of 10 to 5% still show a high viscosity. Further, the wetting power and also the calcium soap dispersing capacity is increased to a considerable extent without reduction of the cleansing or washing power and of the lathering capacity.

Evaluations have also shown that materials cleaned by solutions of this invention are less susceptible to re-soiling due to electrostatic charge. Other evaluations have shown that the degreasing effect on skin and hair characteristic of the usual anion-active detergent compositions which contain cation-active material is diminished to a considerable extent.

Further advantages are to be seen in that the activity of a cationic compound in a mixture of this invention is uninhibited by the presence of the anionic ingredient. For example, if the cationic ingredient is a quaternary ammonium compound, one can still take advantage of its disinfectant and antimycotic properties. Moreover, solutions prepared from mixtures of this invention can be used for chemico-technical purposes, for example, lending water repellence to natural or synthetic fibres or other substances and rendering synthetic fibres and synthetic resins ("plastics") anti-static.

In order that this invention may be well understood, we now give some evaluations to show the properties of the mixtures of this invention and then formulations to prepare various types of solutions from them.

EVALUATIONS.

I. Evaluation to show compatibility of cation compounds with anionic tensides.
An aqueous washing solution containing

20% of anionic tenside was prepared and a quaternary compound added in a concentration of 20% of the detergent content, in accordance with the following Table.

5

Anion-active tenside present in solution	Appearance of solution when cation compound specified below added	
	Alkyldimethylbenzylammonium chloride	Alkyldimethylbenzylammonium saccharinate
Lauryl alcohol diglycolether sulphate, Na salt	turbid	slightly turbid
Lauryl alcohol sulphate, triethanolamine salt	turbid	turbid
Lauryl alcohol triglycolether sulphosuccinic acid ester, Na salt	clear	clear
Lauryl alcohol diglycolether sulphosuccinic acid ester, Na monoethanolamine salt	clear	clear

10 II. Evaluation to determine the bactericidal effect of a solution according to the invention.

1% of each quaternary product identified below was dissolved in an aqueous solution of 15 12% of the sodium salt of lauryl triglycolether sulphosuccinic acid ester. The content of

quaternary substance relative to the content of anionic detergent was about 9%, the total content of detergent being about 1%. Each solution was tested against *Staphylococcus aureus* according to the round filter method and the following results obtained

20

TABLE II

Active ingredient	Restriction of growth	
	Zone 1.	Zone 2.
Cleansing agent alone	0	0
with 1% of alkyldimethyl benzylammonium saccharinate	7	7
with 1% of alkyltri methylammonium saccharinate	3	3
with 1% of alkyldimethyl benzylammonium phthalimide	7	7

FORMULATIONS.

25 1. A Viscous liquid shampoo having anti-dandruff and anti-static effect:

16 parts of lauryl triglycolether sulphosuccinic acid ester, Na salt.

30 1 part of alkyldimethylbenzylammonium saccharinate

4 parts of lauric acid diethanolamide

2 parts of common salt and

77 parts of water

were admixed with gentle heating to provide a clear hair shampoo of agreeable viscosity.

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2. A disinfectant:

16 parts of lauryl triglycolether sulphosuccinic acid ester, Na salt.

1 part of alkyldimethylbenzylalkonium chloride

4 parts of nonylphenolpolyglycolether

40

- 5 parts of comomn salt and
74 parts of water
were admixed with heating to provide a clear
viscous liquid cleansing agent.
- 5 3. A disinfectant:
16 parts lauryldiglycoether sulphosuccinic
acid ester, Na monoethanolamine salt
1 part alkyl dimethylbenzylammonium
phthalimide
- 10 4 parts coconut fatty acid diethanolamide
5 parts common salt and
74 parts water
were admixed with heating and gave a clear
viscous liquid rinsing agent exhibiting a dis-
infecting action.
- 15 4. A liquid cleansing agent having dis-
infectant properties:—
29 parts of sulphosuccinic acid semi-ester
of fatty alcohol polyglycoether, Na salt
- 20 1 part alkyl dimethylbenzylammonium
saccharinate
70 parts water
100 parts of a liquid cleansing agent contain-
ing a disinfectant
- 25 5. A liquid rinsing agent having disinfectant
properties:—
20 parts of Na-alkylaryl sulphonate.
5 parts fatty acid diethanolamide
5 parts fatty alcohol diglycoether sul-
phate, Na salt
- 30 4.5 parts sulphosuccinic acid semi-ester of
fatty alcohol polyglycoether, Na salt
0.5 parts alkyl dimethylbenzylammonium
chloride
- 35 Remainder water to 100
6. A liquid car-wash:
10 parts of sulphosuccinic acid semi-ester
of fatty alcohol polyglycoether, Na-
monoethanolamine salt,
- 40 10 parts of alkyl dimethylhydroxyethyl-
ammonium chloride
Remainder water to 100
7. A liquid water-repellent and anti-static
cleansing agent:
- 45 15 parts of sulphosuccinic acid semi-ester
of fatty alcohol polyglycoether,
Na—NH₂ salt
10 parts alkyl hydroxyethylimidazolinium
chloride
- 50 Remainder water to 100.
8. A disinfectant for personal use:
10 parts sulphosuccinic acid semi-ester of
fatty alcohol polyglycoether, sodium salt
5 parts fatty acid diethanolamide
- 55 5 parts alkyl dimethylbenzylammonium
phthalimide
Remainder water to 100.
9. A liquid de-odourizing foam bath:
30 parts sulphosuccinic acid semi-ester of
fatty acid alkylolamide, Na salt.
6 parts fatty acid alkylolamide
4 parts alkyl dimethylbenzylammonium
saccharinate
Remainder water to 100.
- 65 10. An anti-static wash paste:—

- 30 parts sulphosuccinic acid semi-ester of
fatty acid alkylolamide, Na salt
3 parts fatty acid monoethanolamide
3 parts fatty alcohol sulphate
2 parts alkyl trimethylammonium sulphimi-
date
- 70 Remainder water to 100.

WHAT WE CLAIM IS:—

1. A mixture comprising a multi-functional
anionic detergent and a cation-active com-
pound, the proportion of the latter to the
former not exceeding the molar ratio of
- 75

$$\frac{n-1}{m}$$

where n and m represent the number of
functions of the anionic detergent and cation-
active compound, respectively.

80

2. A mixture as claimed in claim 1, which
the anionic detergent is bifunctional and the
proportion of anionic detergent to cationic
compound is up to the molar ratio of 1:1.
- 85

3. A mixture as claimed in claim 1, in
which the anionic detergent is trifunctional
and the proportion of anionic detergent to
cationic compound is up to the molar ratio of
1:2.
- 90

4. A detergent mixture comprising a multi-
functional anionic detergent and a cation-
active compound selected from the class of so-
called onium compounds, the proportion of the
latter to the former in the composition not
exceeding the molar ratio of
- 95

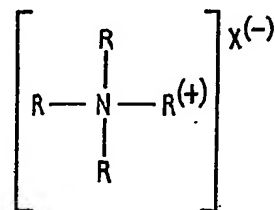
$$\frac{n-1}{m}$$

where n and m represent the number of
functions of the anionic detergent and cation-
active-compound respectively.

100

5. A mixture as claimed in claim 4 in which
the onium compound is an ammonium, phos-
phonium, pyridinium or sulphonium com-
pound.

6. A mixture as claimed in claim 5, in
which the onium compound is a quaternary
ammonium compound of the general formula
- 105



in which R represent an alkyl group and X is
an anion.

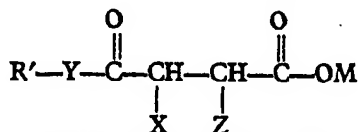
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7. A mixture as claimed in claim 6, in
which X represents an halide, the phthalimi-

date, saccharinate, HSO_4^- or acid sulphimide anion.

8. A mixture as claimed in claim 6, in which one of substituents R represents a long chain alkyl residue having from 4 to 22 carbon atoms.

9. A mixture comprising a bi-functional anionic detergent of the general formula



- 10 in which R' represents an alkyl residue having at least 6 carbon atoms, Y represents a hydrocarbon chain optionally substituted with oxygen or nitrogen or both, either of X and Z represents a hydrogen atom and the other is the group SO_3M , and M is a pharmaceutically or cosmetically acceptable cation; and a cation-active compound, the proportion of the latter to the former in the composition not exceeding the molar ratio of

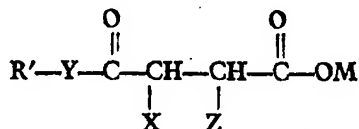
$$\frac{n-1}{m}$$

where n and m represent the number of functions of the anionic detergent and cation-active compounds, respectively.

10. A mixture as claimed in claim 9, in which substituent M of the general formula represents a metal, amine, alkanolamine or ammonium.

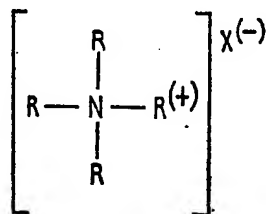
11. A mixture as claimed in claim 9, in which the anionic detergent is a sulpho-fatty acid, a compound with two sulpho-groups or with one sulpho-group and a carboxyl-group or with two carboxyl groups in the molecule, a phosphonic acid with an alkyl residue and two acid functions or an alkylphosphoric acid with two acid functions.

12. A mixture comprising a multifunctional anionic sulphosuccinic detergent of the general formula



- 40 (in which R' represents an alkyl residue having at least 6 carbon atoms, Y represents a hydrocarbon chain optionally substituted with oxygen or nitrogen or both, either of X and Z represents a hydrogen atom and the other is the group $-\text{SO}_3\text{M}$, and M is a pharmaceutically or cosmetically acceptable cation), and a

cation quaternary ammonium compound of the general formula



(in which R is an alkyl group and X is an anion), the proportion of the latter to the former not exceeding the molar ratio of

$$\frac{n-1}{m}$$

where n and m represent the number of functions of the anionic sulphosuccinic detergent and cation quaternary ammonium compound respectively.

13. A mixture as claimed in claim 12, in which the anionic detergent is bifunctional and the proportion of anionic detergent to cationic compound is up to the molar ratio of 1:1.

14. A mixture as claimed in claim 12, in which the anionic detergent is trifunctional and the proportion of anionic detergent to cationic compound is up to the molar ratio of 1:2.

15. A mixture as claimed in any of the preceding claims, in which the anionic detergent is a lauryl alcohol derivative.

16. A mixture as claimed in any of the preceding claims, in which the anionic detergent is a lauryl alcohol derivative of a sulphosuccinic acid.

17. A mixture as claimed in any of the preceding claims, in which the cationic compound is an alkyl dimethylbenzylammonium compound.

18. A mixture as claimed in any of the preceding claims, substantially as herein described.

19. An aqueous solution of a mixture as claimed in any of the preceding claims.

20. A cleaning composition formed from a mixture as claimed in any claims 1 to 18.

21. A cosmetic composition formed from a mixture as claimed in any of claims 1 to 18.

22. A composition formed from a mixture comprising a multifunctional anionic detergent and a cation compound substantially as herein described with reference to any of formulations 1 to 10.

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